

THORACIC WALL (INTERCOSTAL SPACES)

Lecture (2)

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Objectives:

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- **Basic anatomy, to identify:**
 - ▣ Muscles of the thoracic wall.
 - ▣ Vessels and nerves of the thoracic wall.
- **Clinical notes:**
 - ▣ To explain why a patient suffering from dyspnea lean on their knees or on the arms of a chair to (catch some air).
- **Surface anatomy, to define:**
 - ▣ Midclavicular line.
 - ▣ Axillary lines.
 - ▣ Subcostal angle.
 - ▣ Costal margin.
 - ▣ Dermatomes.

Introduction: lecture's map

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- **Intercostal space.**

- **Intercostal:**

 - **Muscles.**

 - **Nerves.**

 - **Arteries.**

 - **Veins.**

 - **lymphatics**

Intercostal Spaces

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- ☐ **lie between adjacent ribs.**
- ☐ **The intercostal muscles occupy the intercostal spaces.**

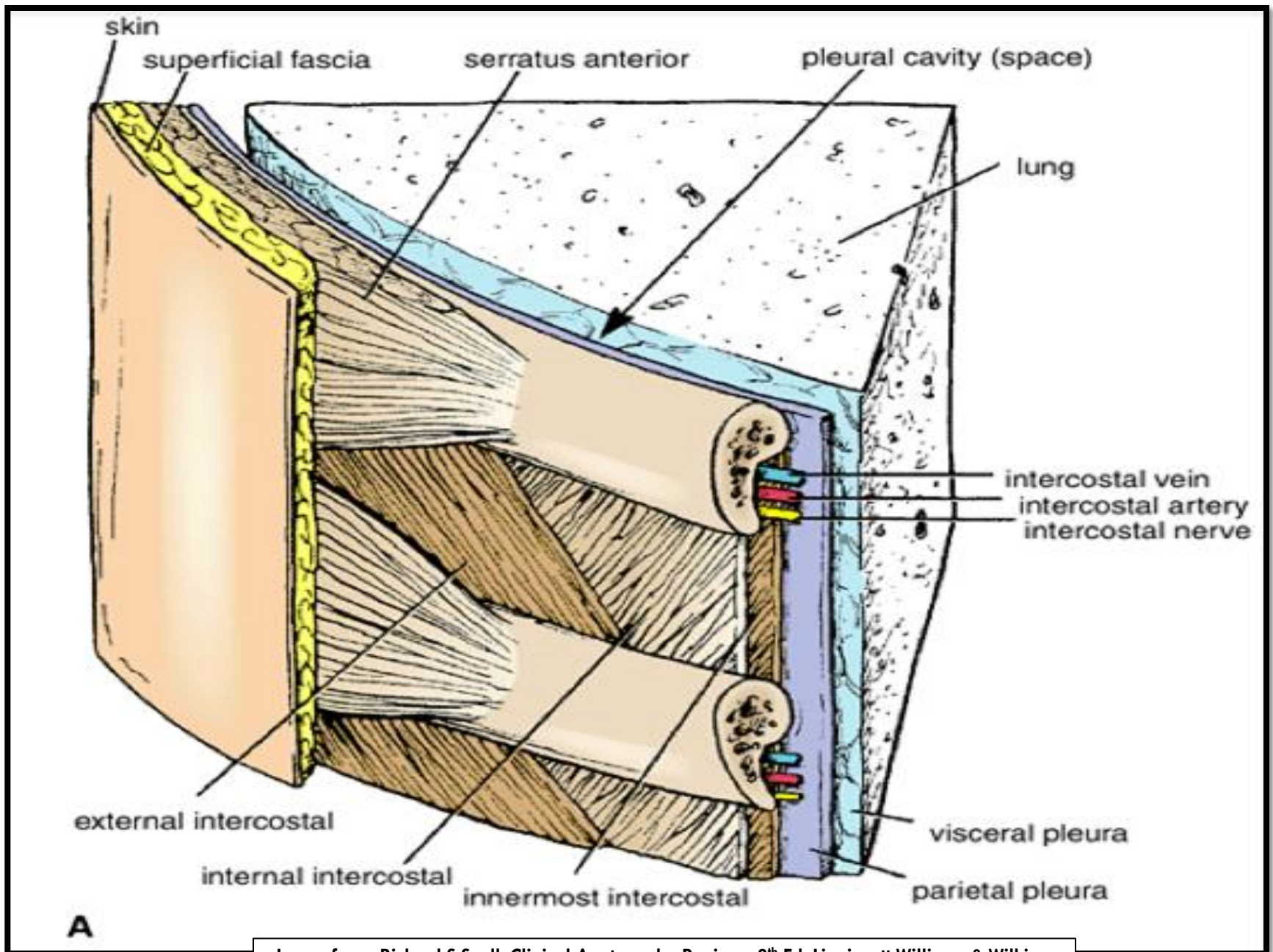


Image from: Richard S. Snell, Clinical Anatomy by Regions, 8th Ed. Lippincott Williams & Wilkins.

Intercostal Spaces

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- ❑ In each space, intercostal nerves and associated major arteries and veins:
 - ▣ Lie in the costal groove along the inferior margin of the superior rib.
 - ▣ Pass in the plane between the inner two layers of muscles.

Costal Groove in a Typical Rib

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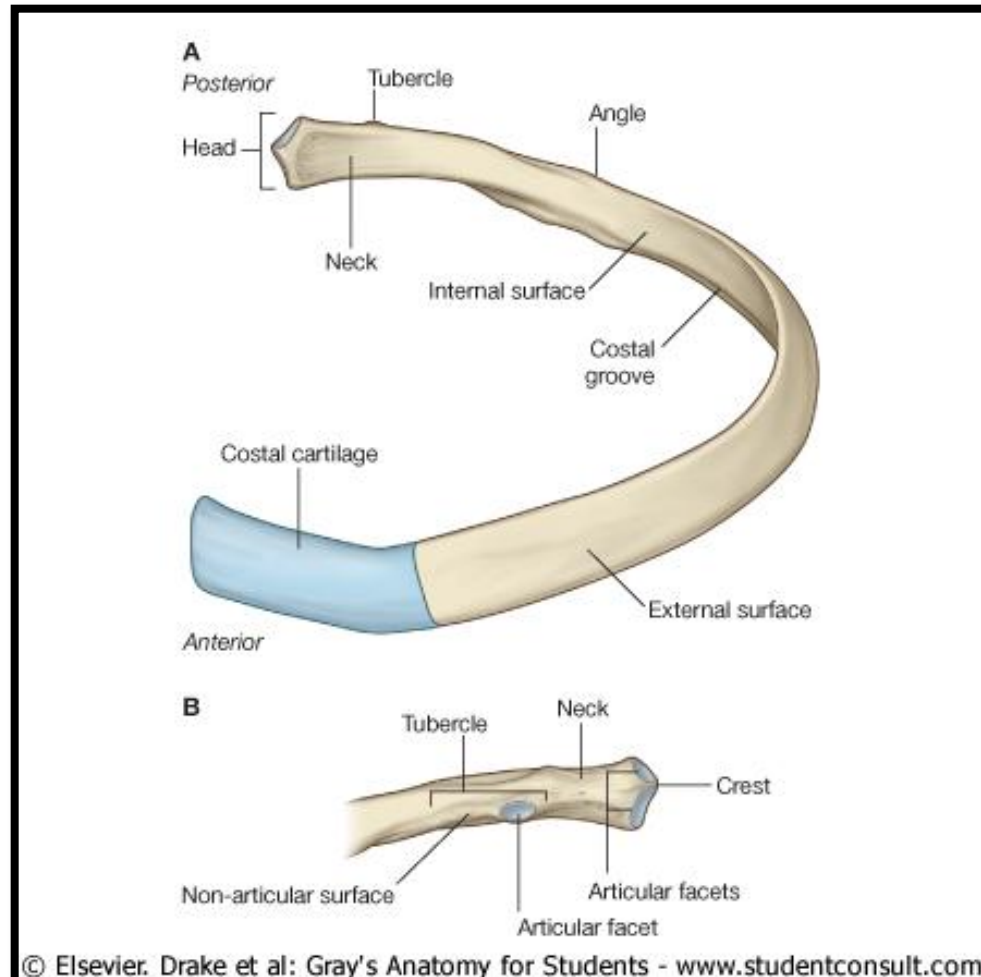
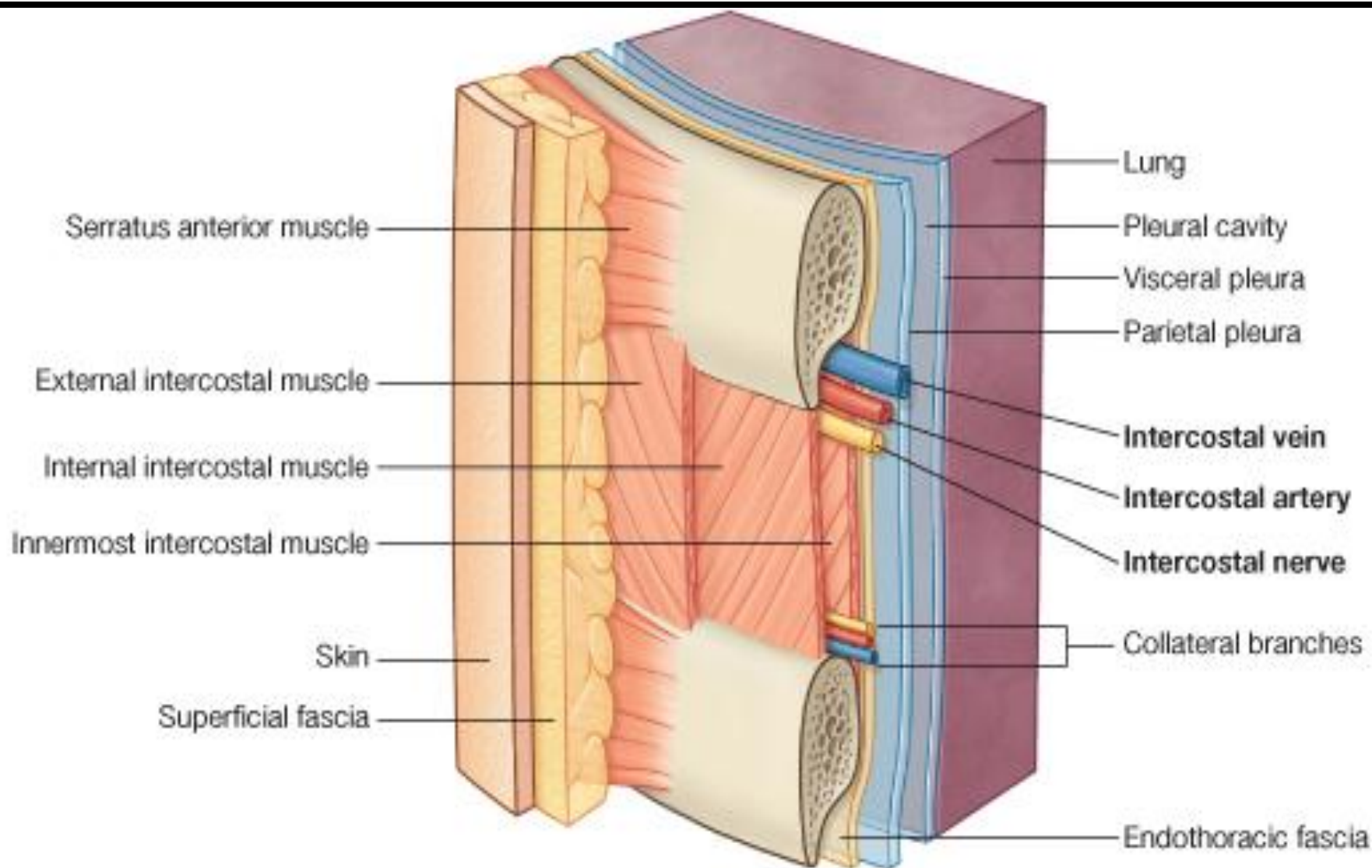


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Lecture's map

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- Intercostal space.

- **Intercostal:**

 - **Muscles.**

 - **Nerves.**

 - **Arteries.**

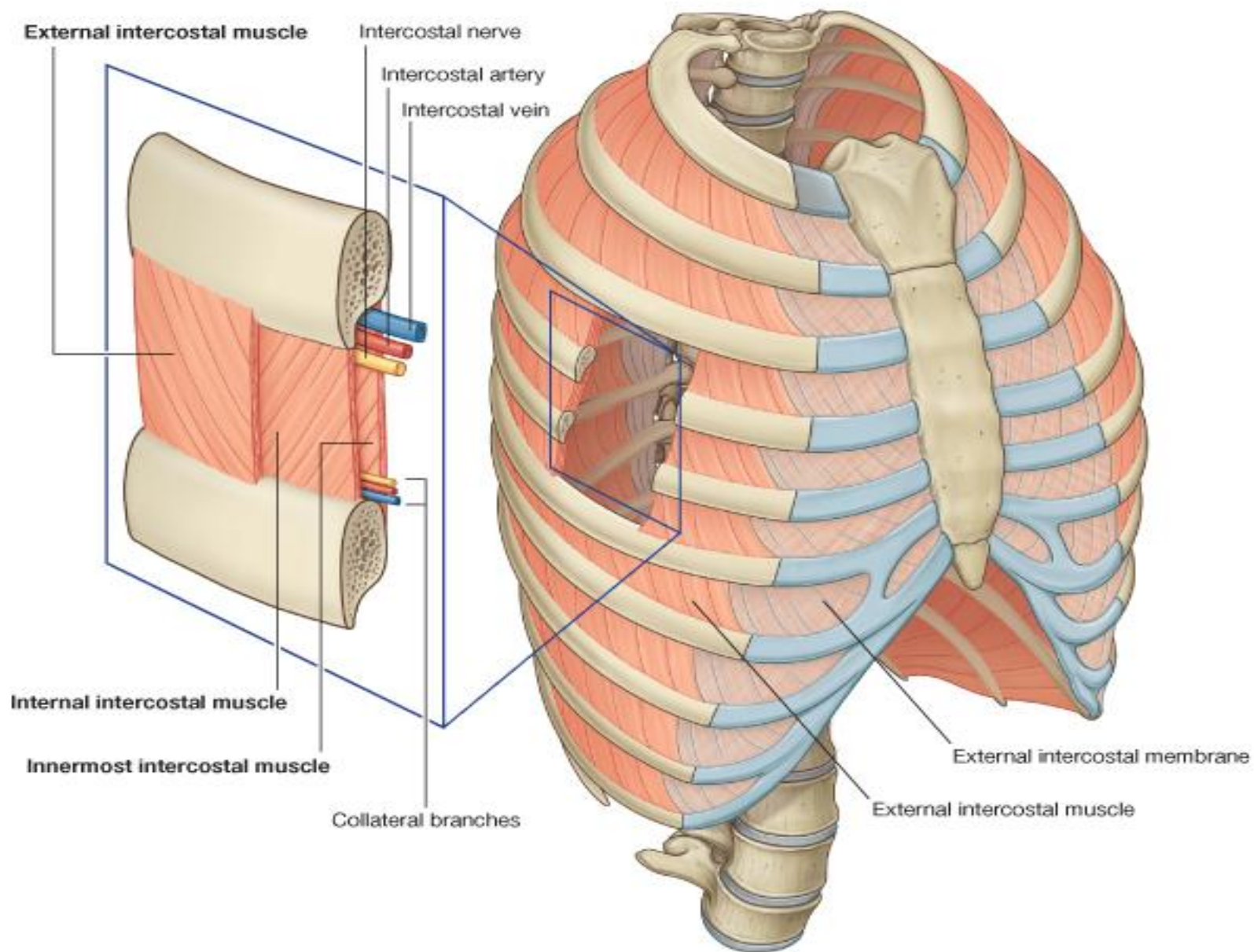
 - **Veins.**

 - **lymphatics**

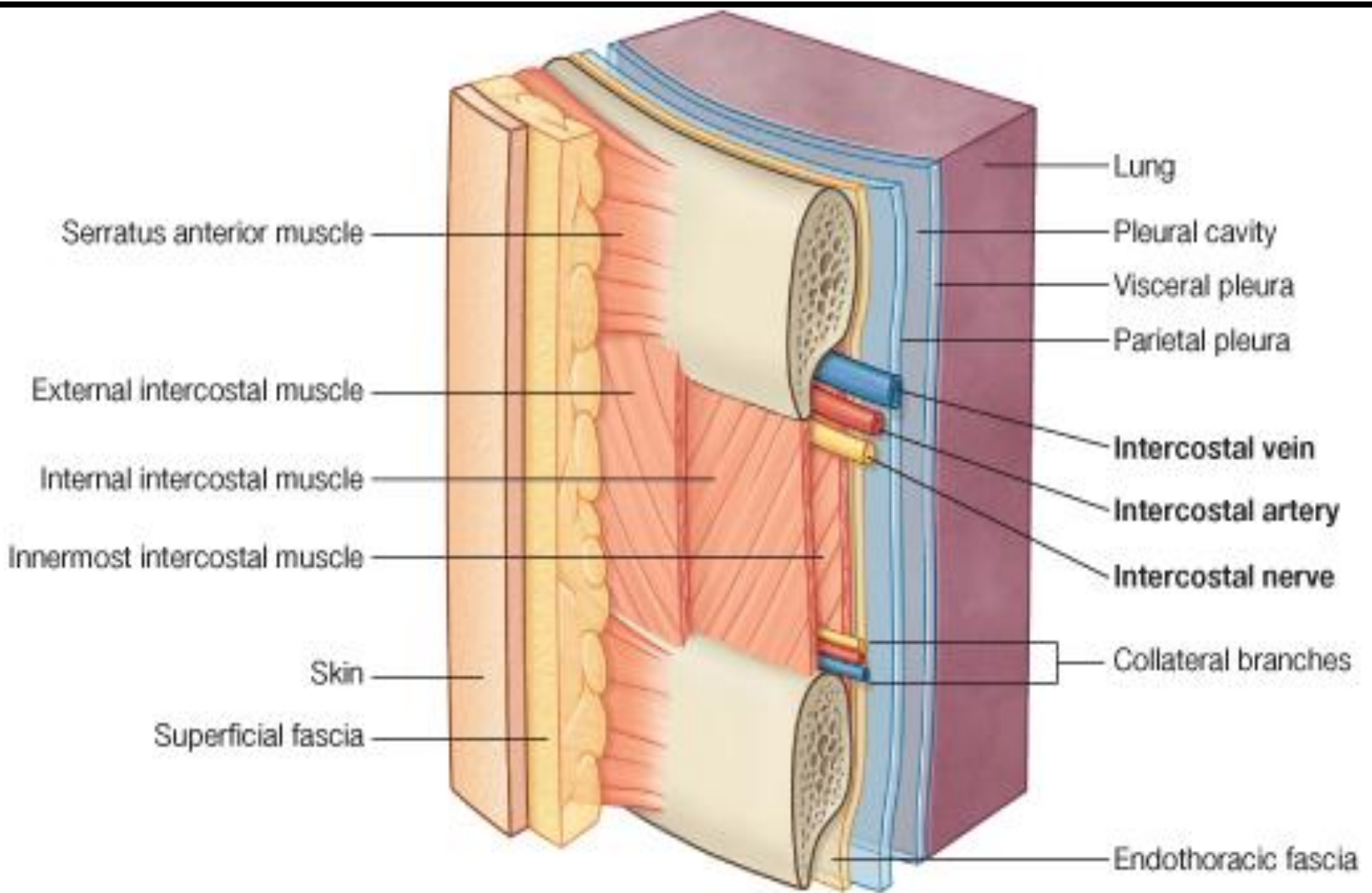
Intercostal Muscles

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- **External intercostal muscle:**
 - Forms the superficial layer.
- **Internal intercostal muscle:**
 - Forms the middle layer.
- **Innermost intercostal muscle:**
 - Forms the deepest fibers.

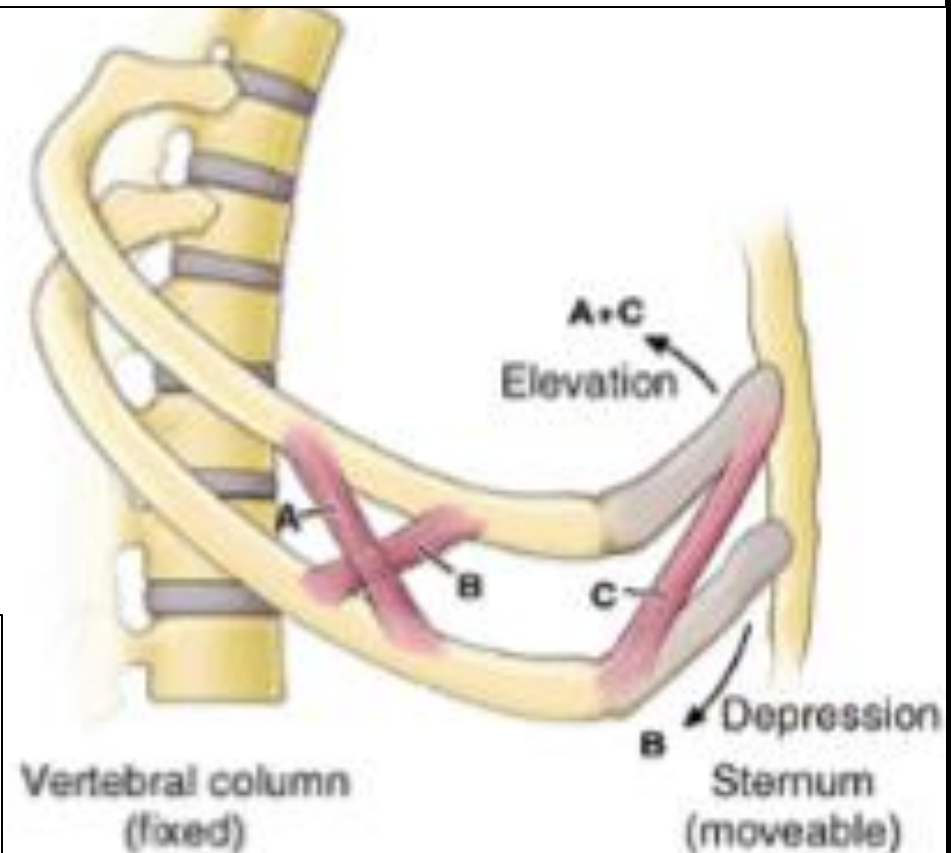


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Actions of intercostal muscles



- A = external intercostal m.
- B = internal (and innermost) intercostal m. interosseous part
- C = internal intercostal m. interchondral part

Lateral view

Actions of the intercostal muscles

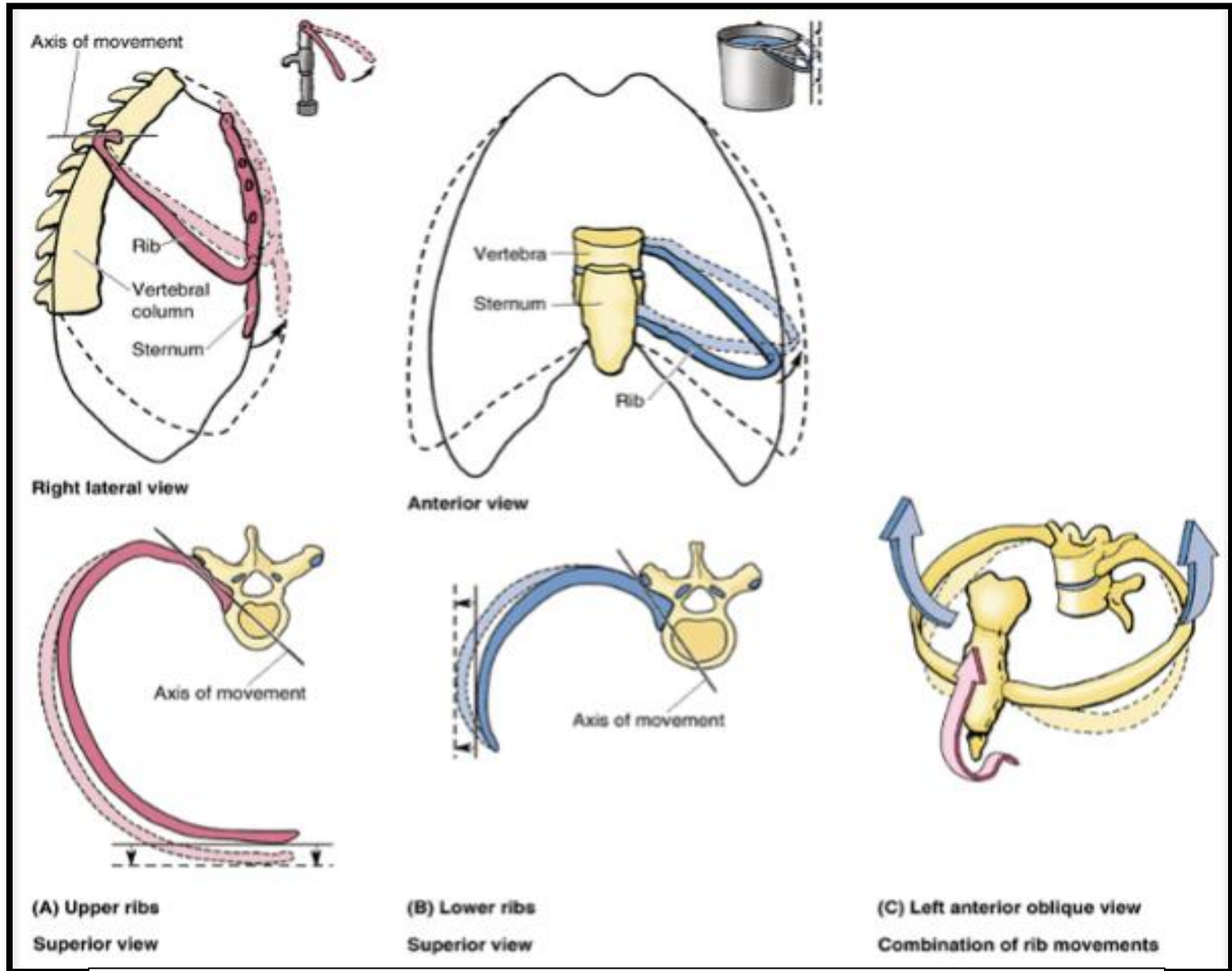


Image from: Moore, Keith L.; Dalley, Arthur F, Clinically Oriented Anatomy, 5th Ed. Lippincott Williams & Wilkins; 2006.

Clinical note: Dyspnea

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- **When people with respiratory problems (e.g., asthma) or with heart failure struggle to breathe, they use their accessory respiratory muscles to assist the expansion of their thoracic cavity. They lean on their knees or on the arms of a chair to fix their pectoral girdle so these muscles are able to act on their rib attachments and expand the thorax.**

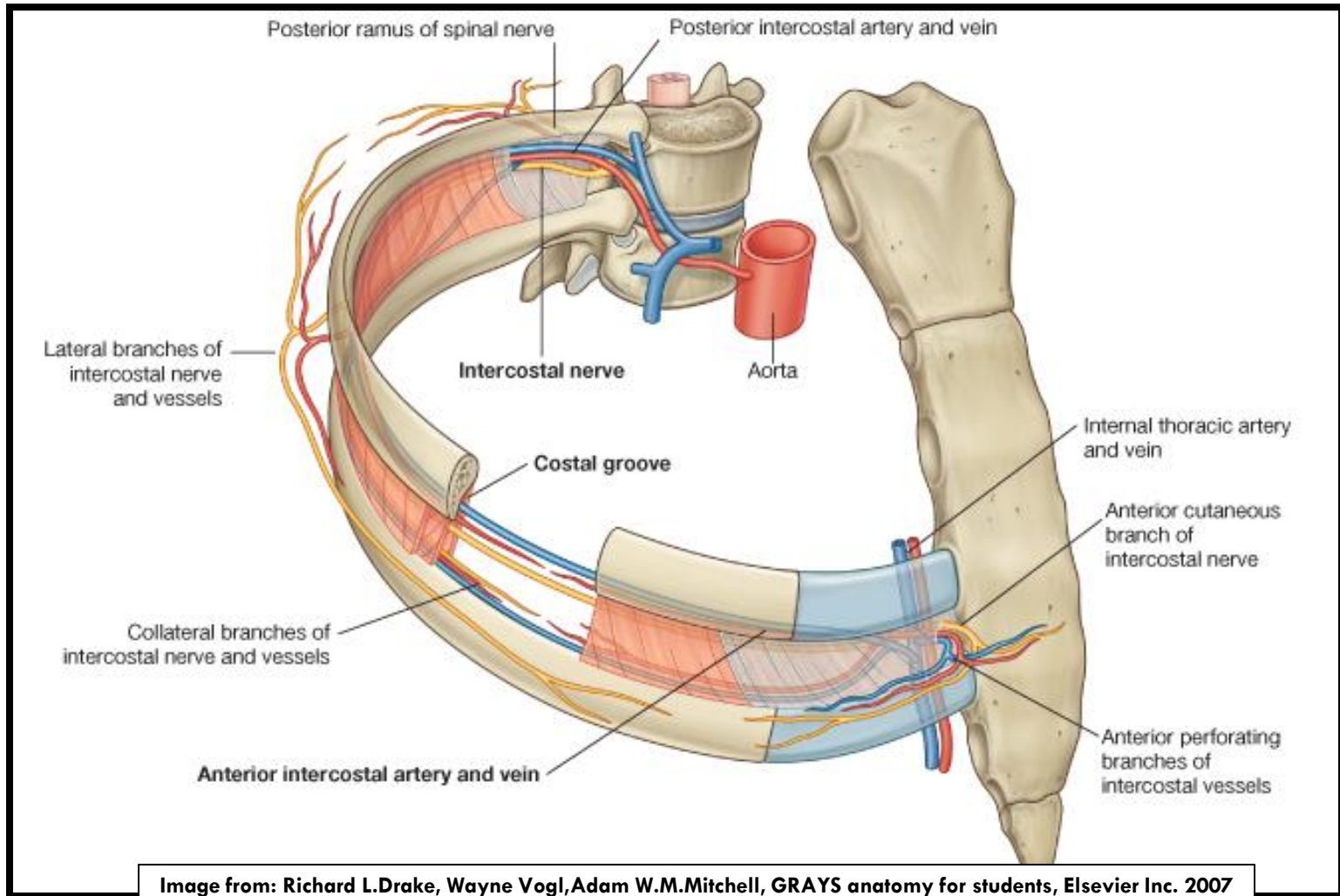
Lecture's map

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- Intercostal space.
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Nerves Of The Thoracic Wall

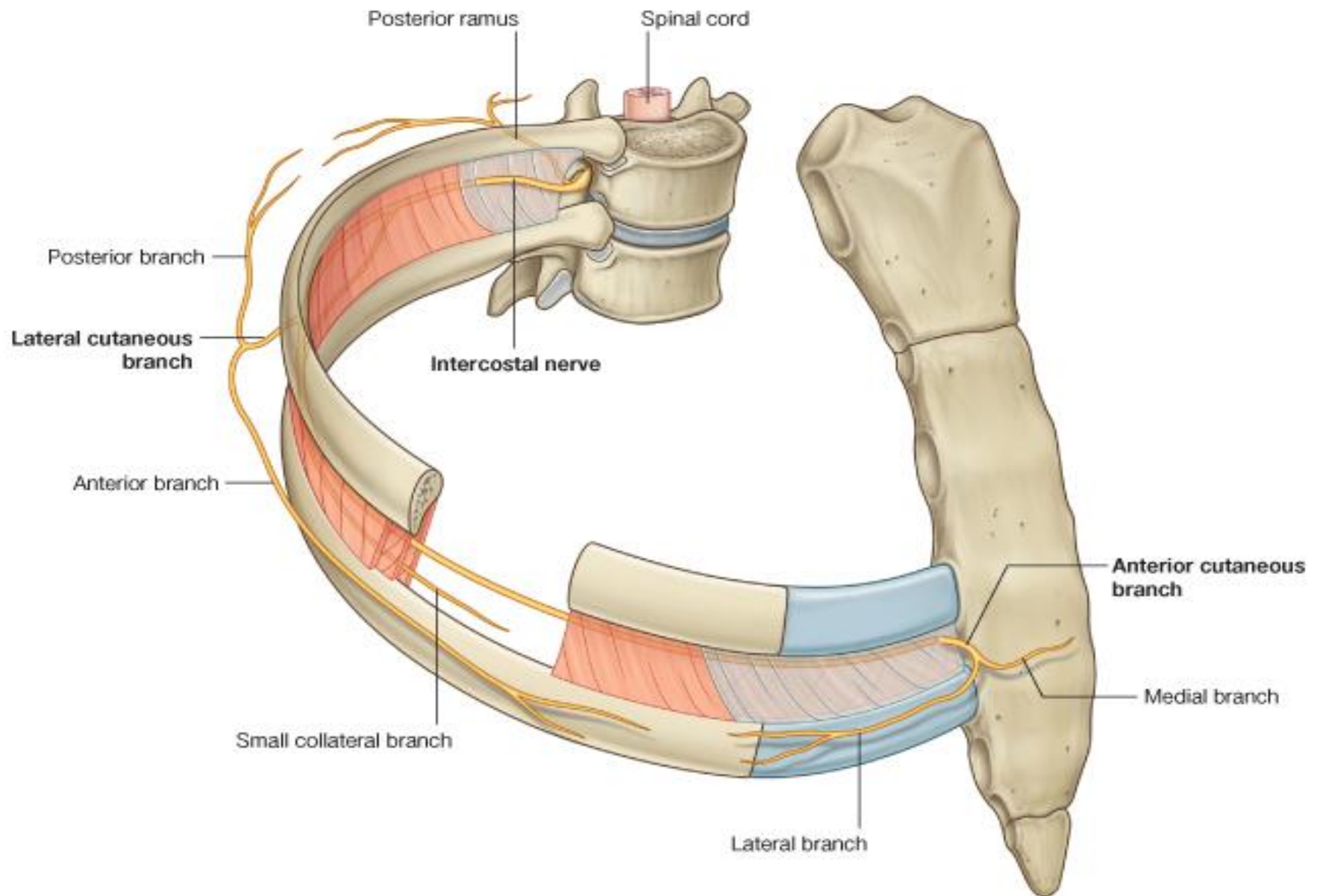
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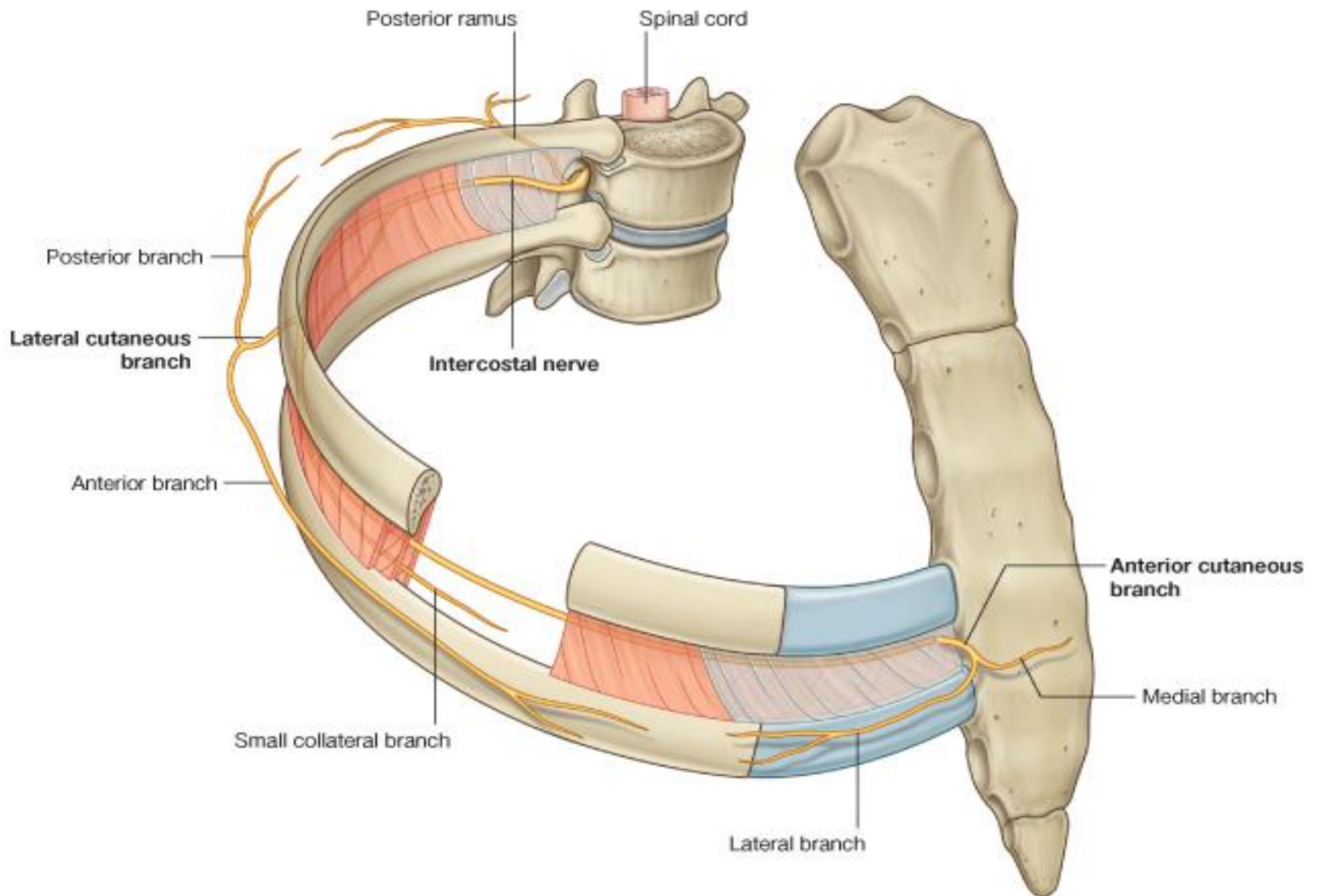
Nerves Of The Thoracic Wall

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- **The 12 pairs of thoracic spinal nerves supply the thoracic wall.**
- **Each one is divided into anterior and posterior rami .**



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Branches from each nerve

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- ❑ **Rami communicantes.**
- ❑ **Collateral branches.**
- ❑ **Lateral cutaneous branches.**
 - ❑ **Anterior + posterior**
- ❑ **Anterior cutaneous branches.**
 - ❑ **Medial + lateral**
- ❑ **Muscular branches.**

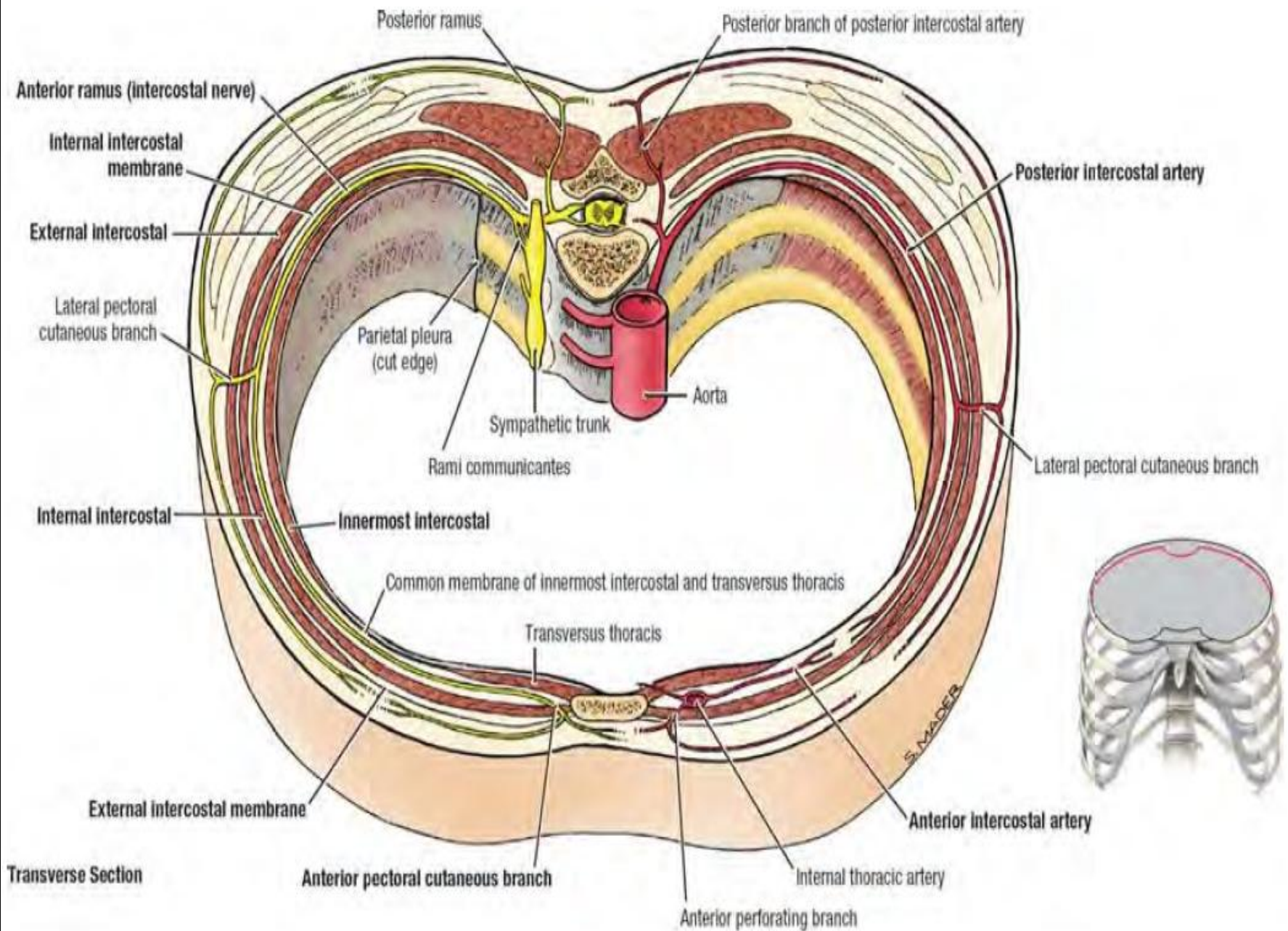


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- **The posterior rami of thoracic spinal nerves pass posteriorly, to supply the joints, muscles , and skin of the back in the thoracic region.**

Atypical Intercostal Nerves

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- **The 1st intercostal nerve has no anterior cutaneous branch.**
- **The 2nd (and sometimes 3rd) intercostal nerve gives rise to a large lateral cutaneous branch, the intercostobrachial nerve.**

Atypical Intercostal Nerves

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- **The 7th to 11th intercostal nerves, after giving rise to lateral cutaneous branches, cross the costal margin posteriorly and continue on to supply abdominal skin and muscles.**

The subcostal nerve.

26

□ **The anterior ramus of nerve T12, coursing inferior to the 12th rib.**

Lecture's map

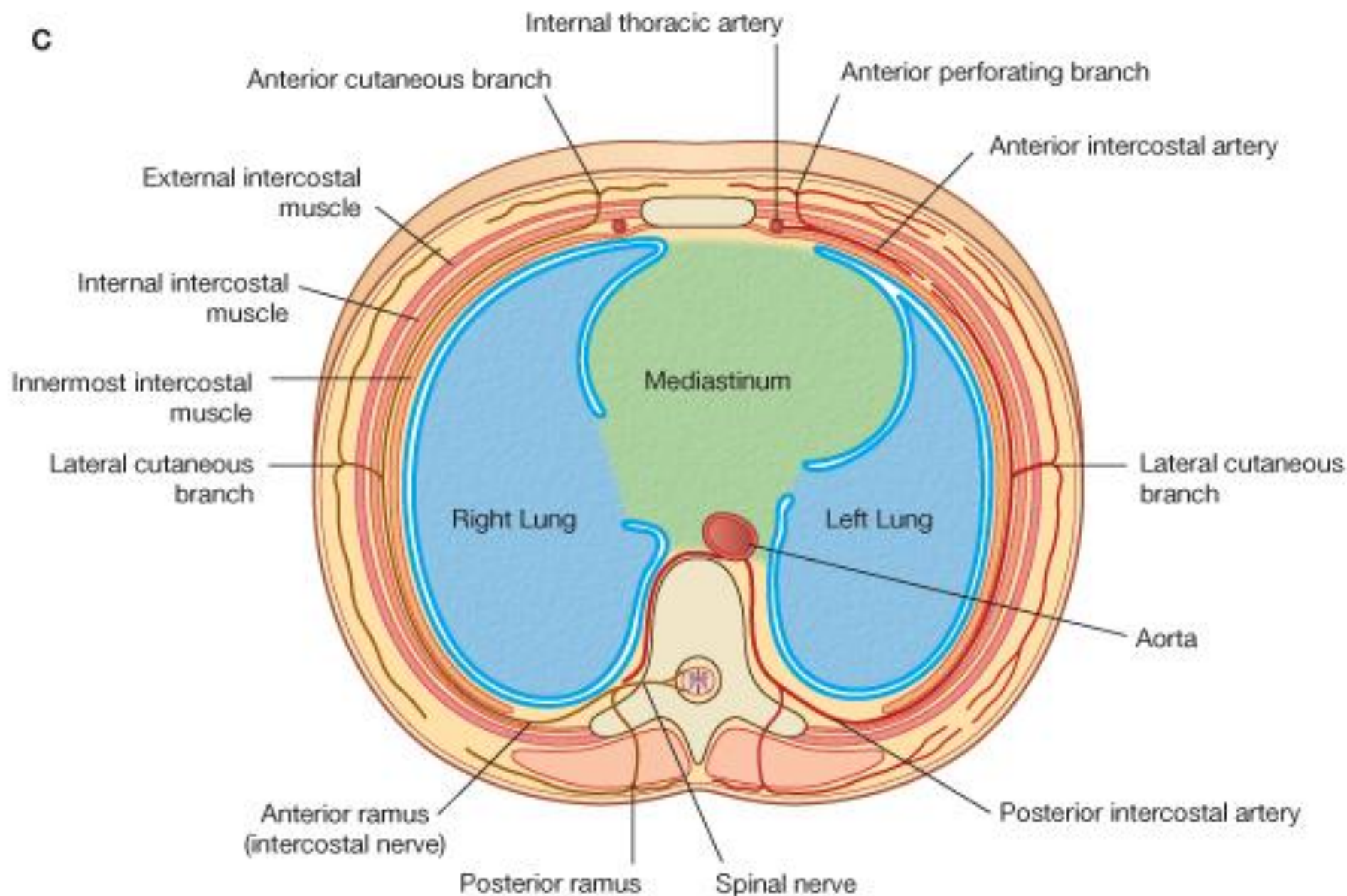
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Arterial Supply of Thoracic Wall

- Anterior intercostal arteries.
- Posterior intercostal arteries.

C



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Anterior Intercostal Arteries

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- ❑ **Arise from internal thoracic artery.**
- ❑ **The arteries for the intercostal spaces 7 to 9 arise from the musculophrenic arteries.**

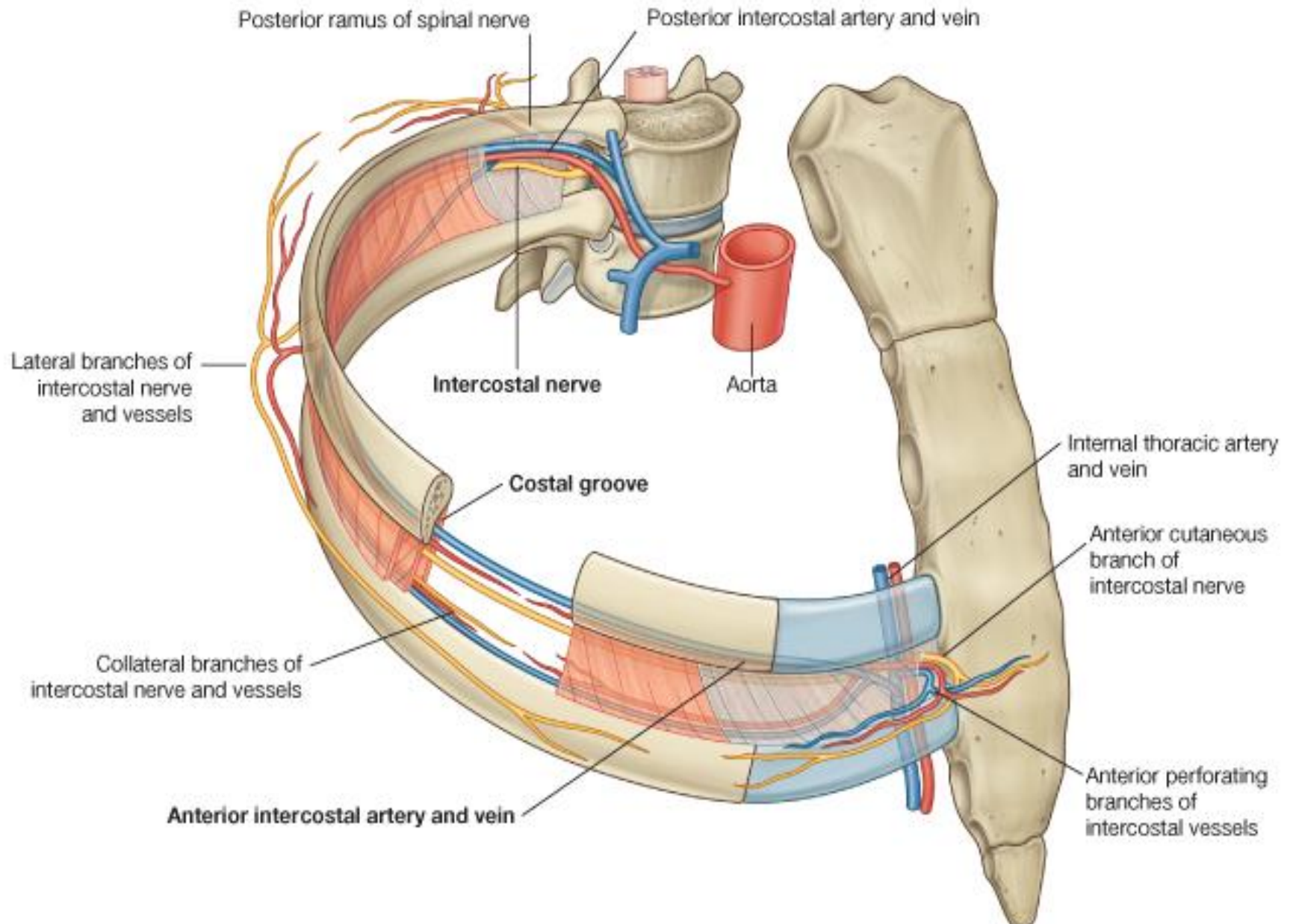


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Posterior Intercostal Arteries

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- **Arise from the descending aorta.**
- **The arteries for the intercostal spaces 1 and 2 arise from the Superior intercostal artery .**

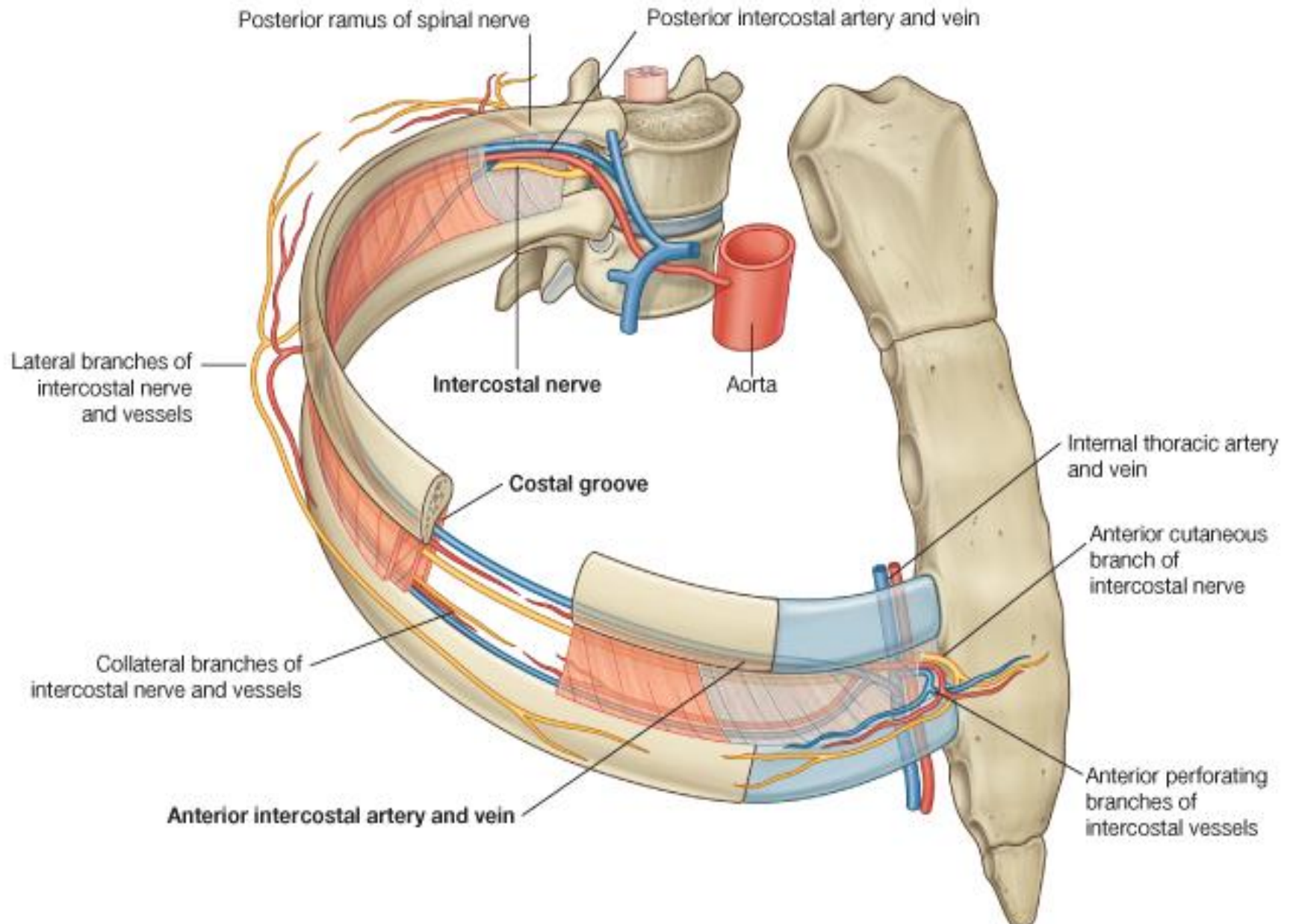
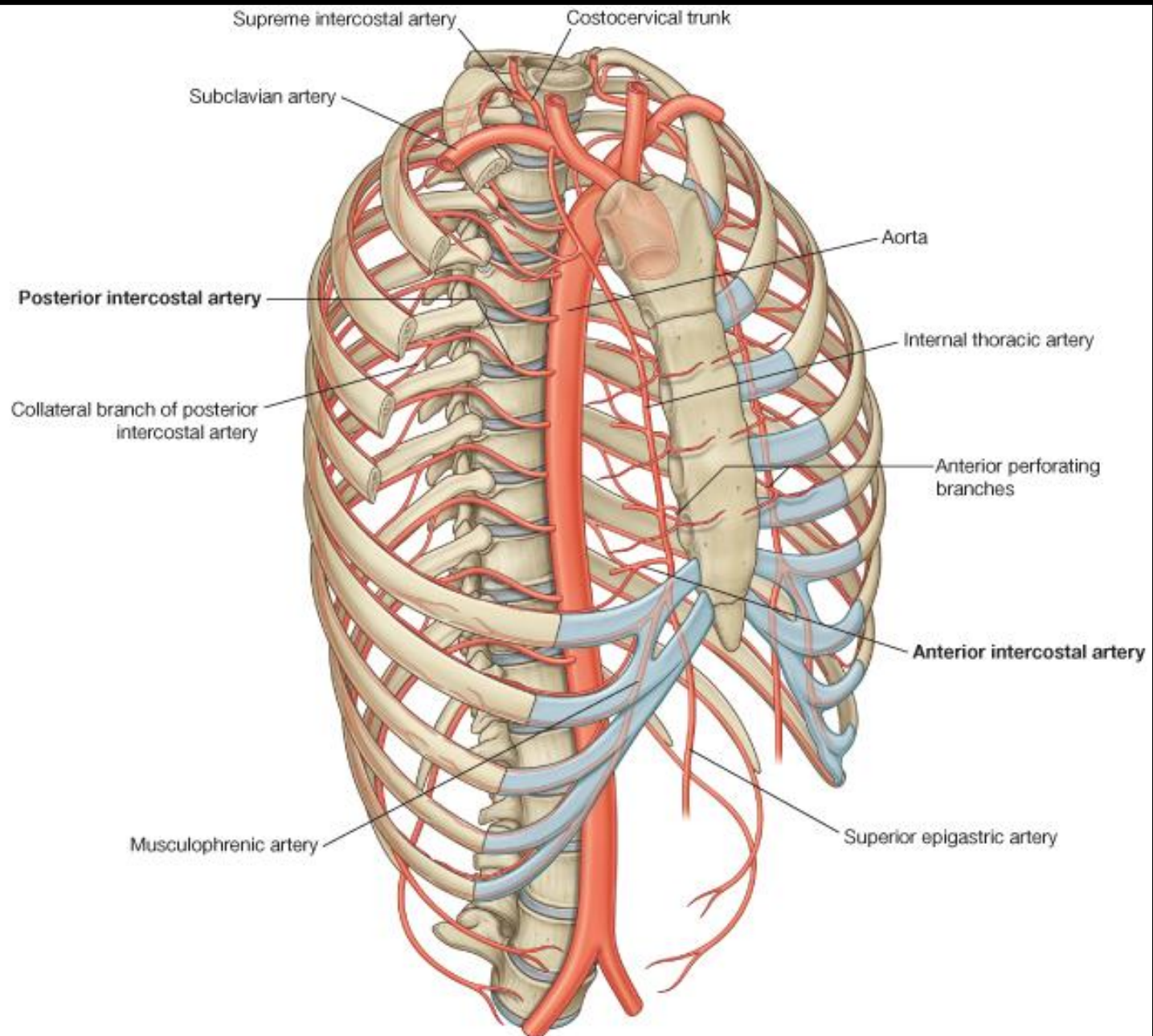


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**The Subcostal artery
courses along inferior
border of 12th rib to the
muscles of anterolateral
abdominal wall.**



Lecture's map

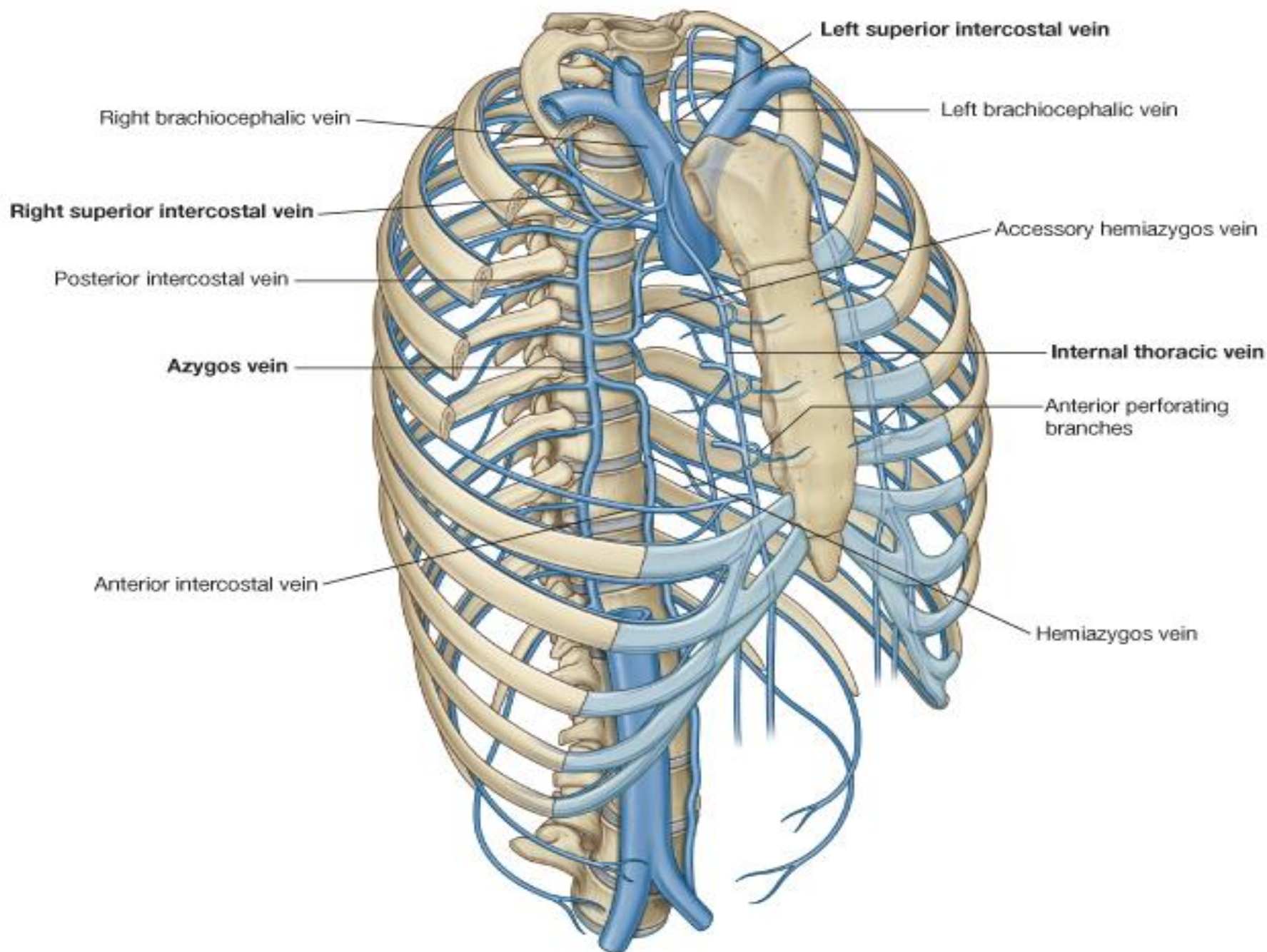
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- Intercostal space.
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Venous Drainage (Veins Of The Thorax)

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- **Anteriorly they drain into the internal thoracic veins.**
- **Posteriorly they drain into the azygos/hemiazygos venous system.**

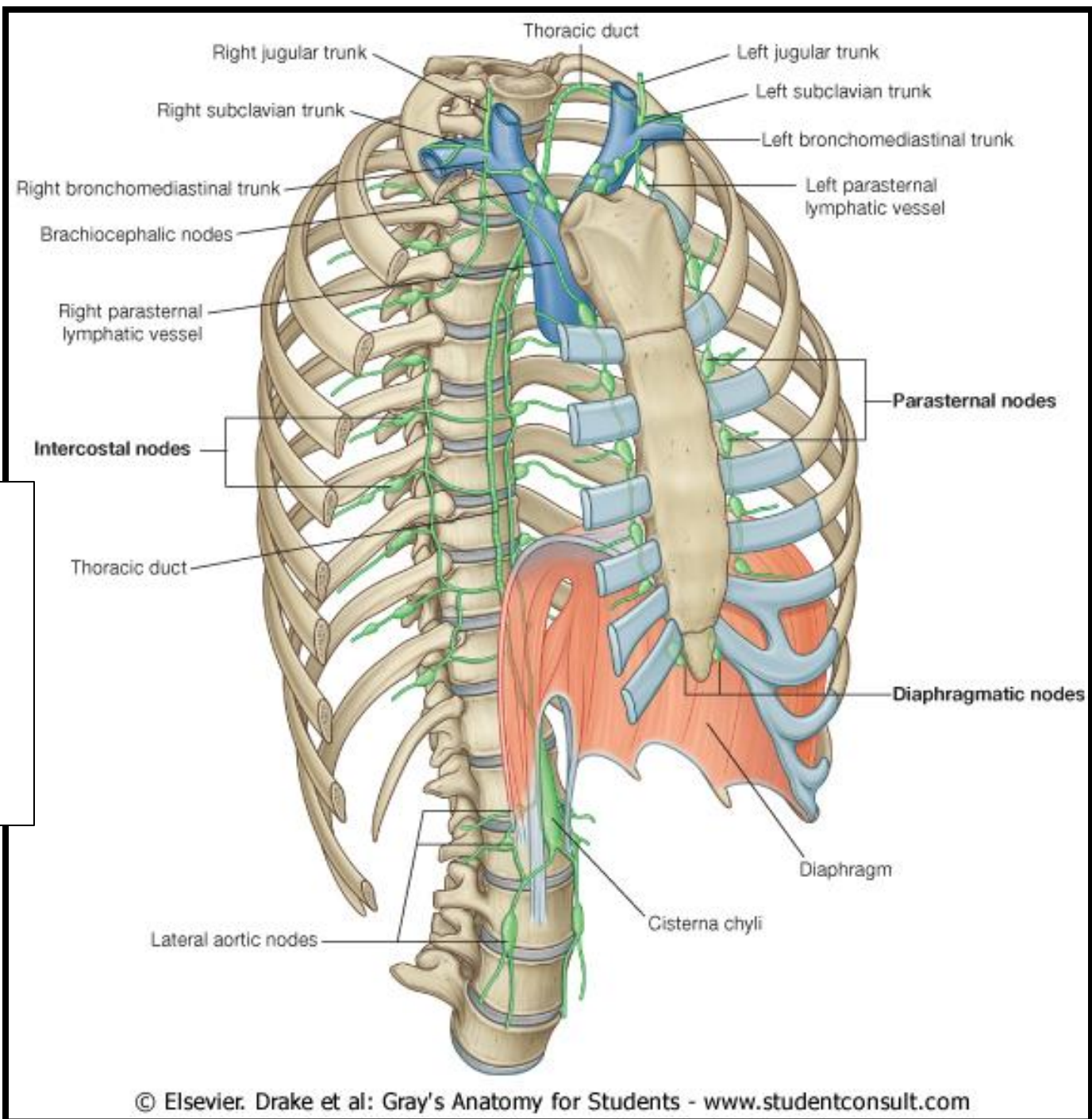


Lecture's map

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Lymphatic drainage of the thoracic wall



Lymphatic vessels of the thoracic wall drain mainly into:

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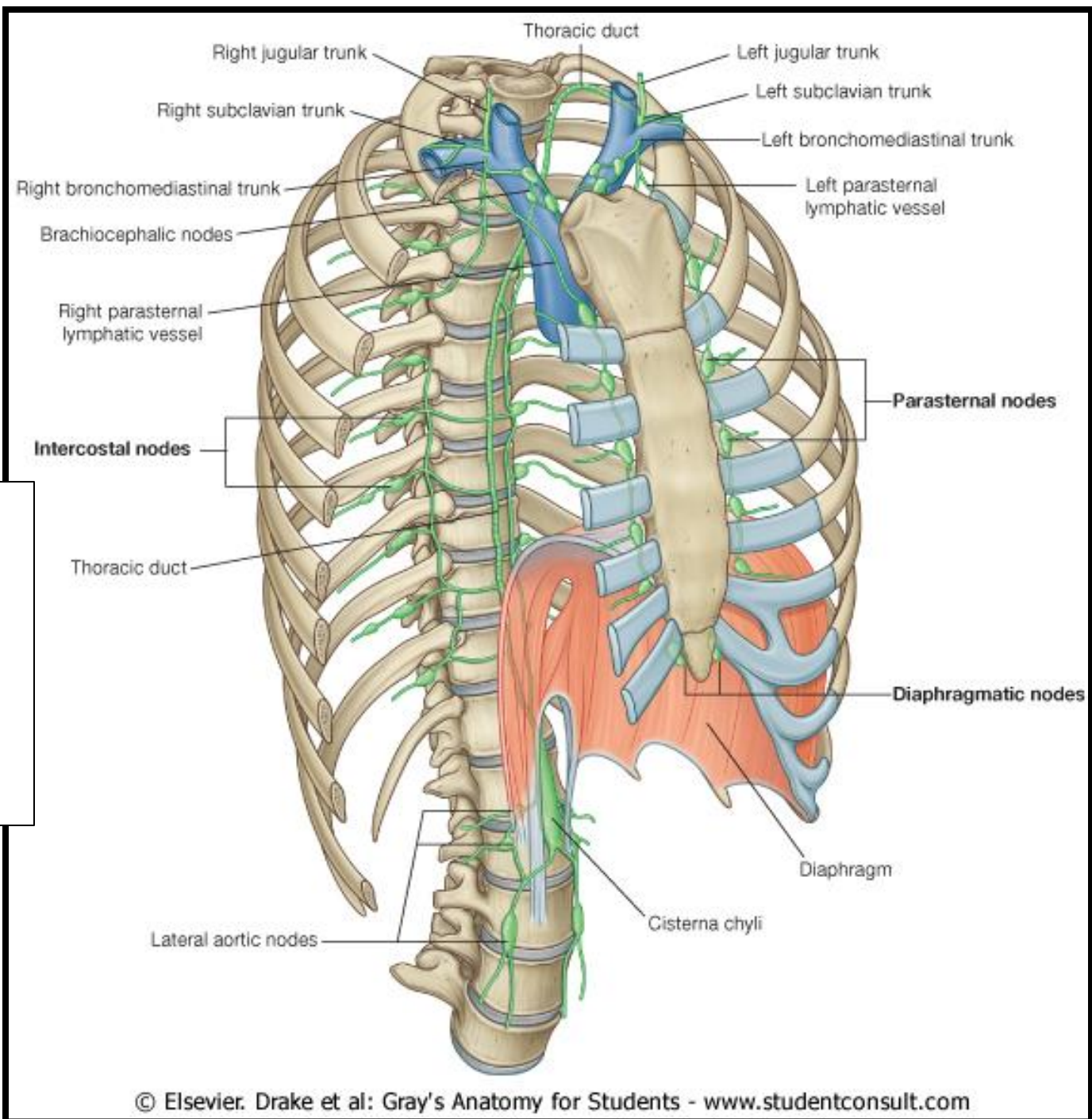
- ☐ **Parasternal nodes.**
- ☐ **Intercostal nodes.**
- ☐ **Diaphragmatic nodes.**

Parasternal nodes:

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- **They are lymph nodes associated with the internal thoracic arteries.**
- **They drain into bronchomediastinal trunks**

Lymphatic drainage of the thoracic wall

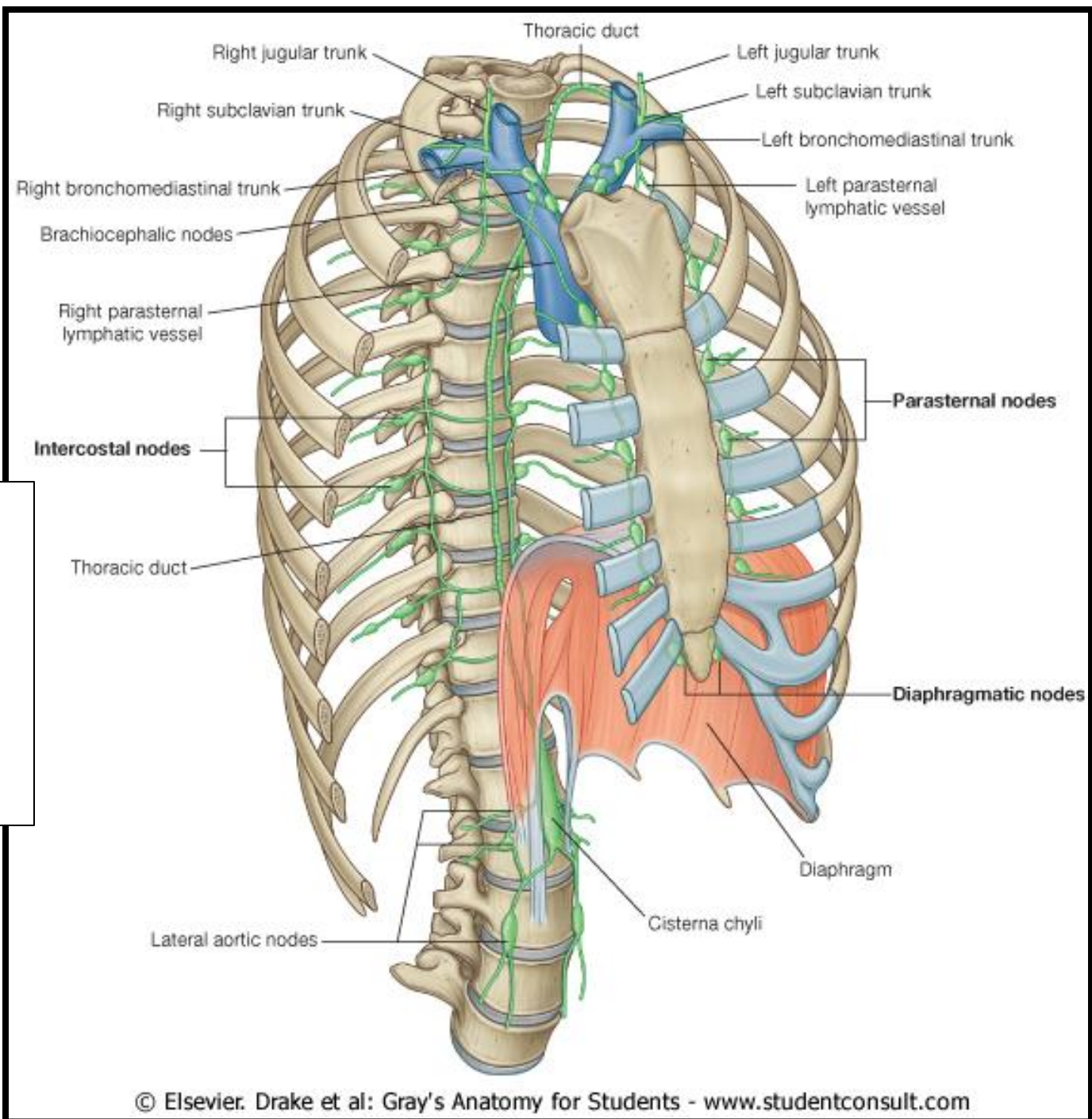


Intercostal nodes:

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- They are lymph nodes associated with the heads and necks of ribs.
- Intercostal nodes in the upper thorax also drain into the bronchomediastinal trunks.
- Whereas intercostal nodes in the lower thorax drain into the thoracic duct

Lymphatic drainage of the thoracic wall

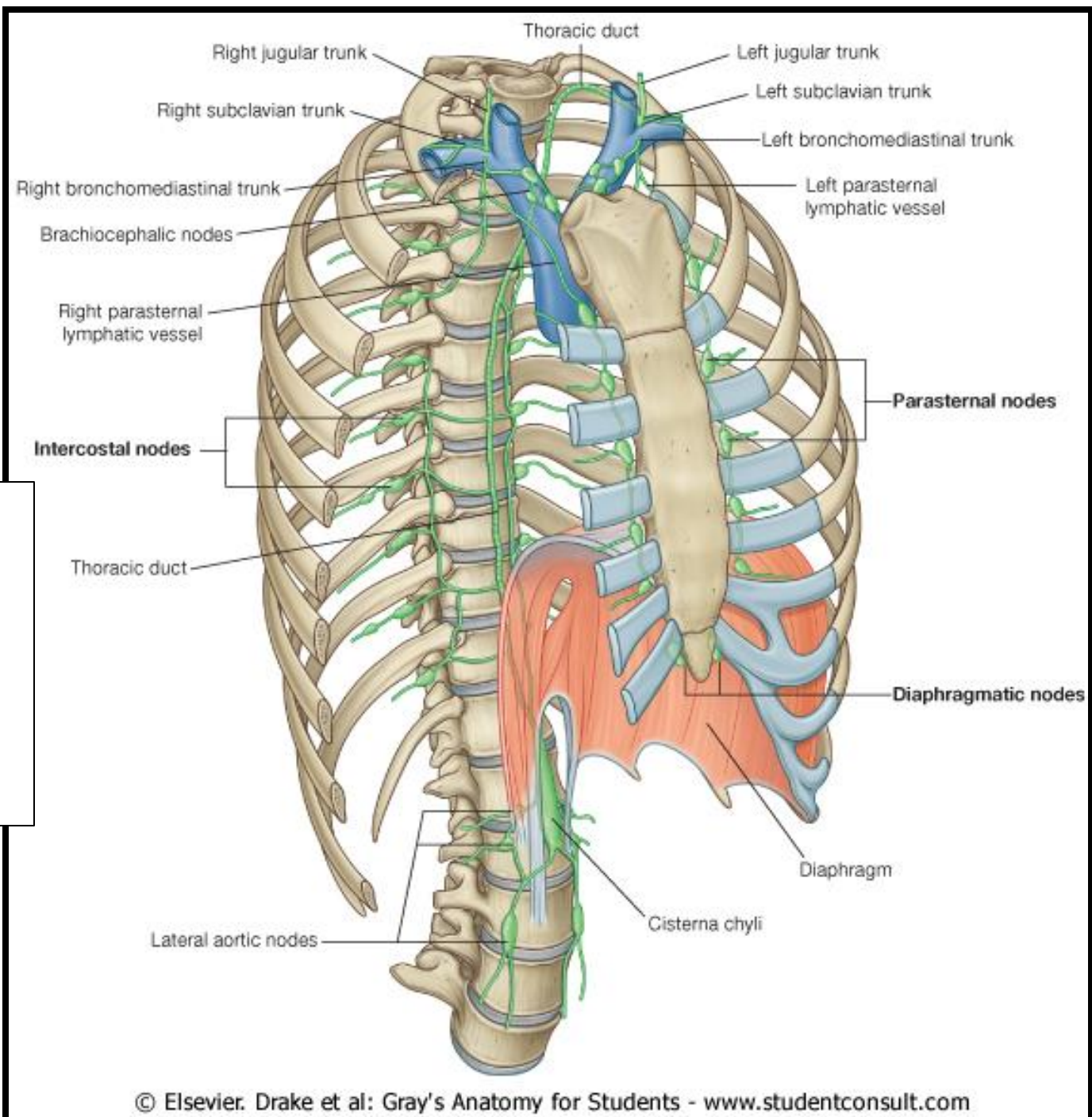


Diaphragmatic nodes:

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- **They are lymph nodes associated with the diaphragm.**
- **Diaphragmatic nodes are posterior to the xiphoid and at sites where the phrenic nerves penetrate the diaphragm.**
- **They also occur in regions where the diaphragm is attached to the vertebral column.**

Lymphatic drainage of the thoracic wall



Surface anatomy

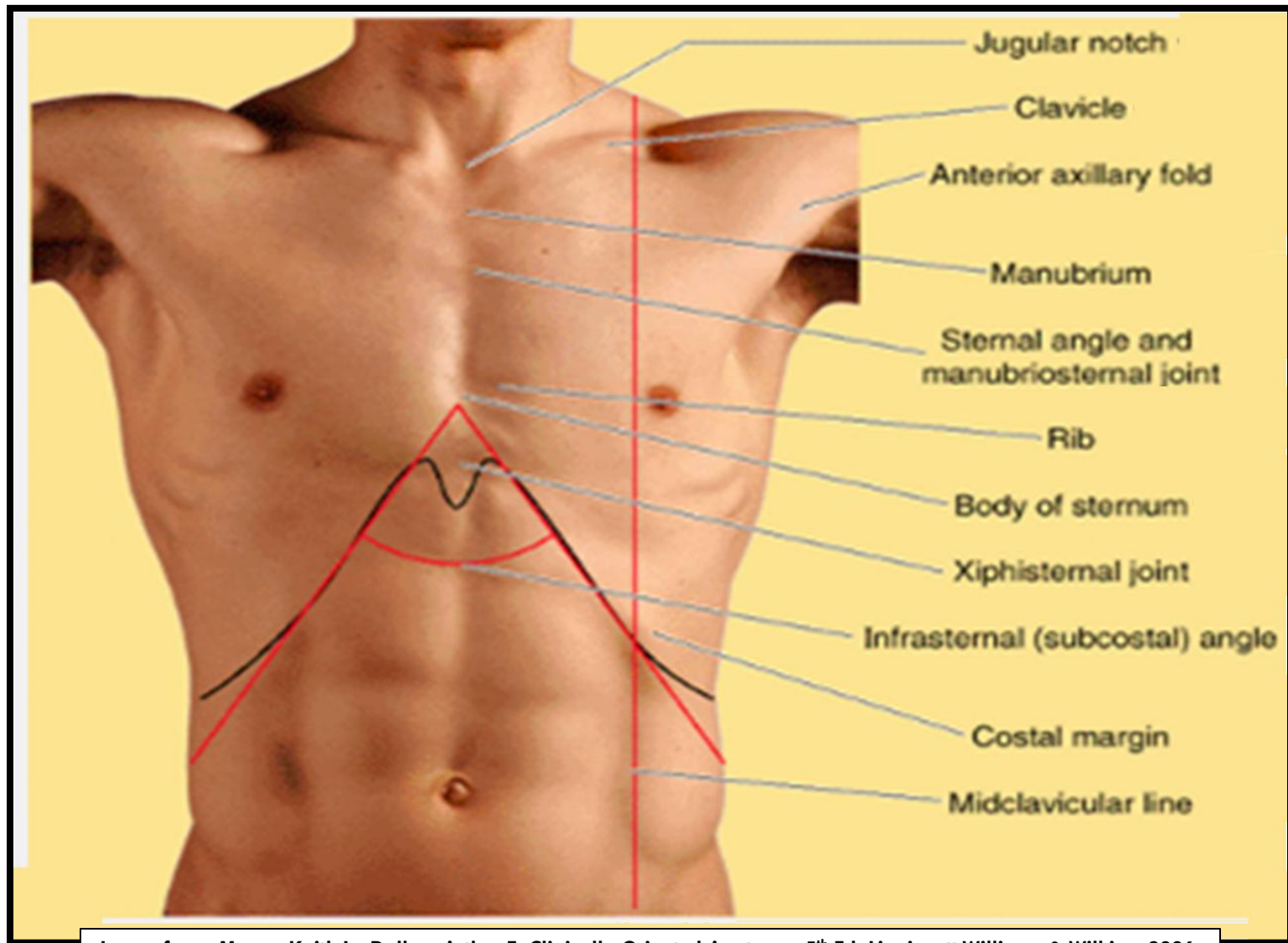


Image from: Moore, Keith L.; Dalley, Arthur F, Clinically Oriented Anatomy, 5th Ed. Lippincott Williams & Wilkins; 2006.

Surface anatomy

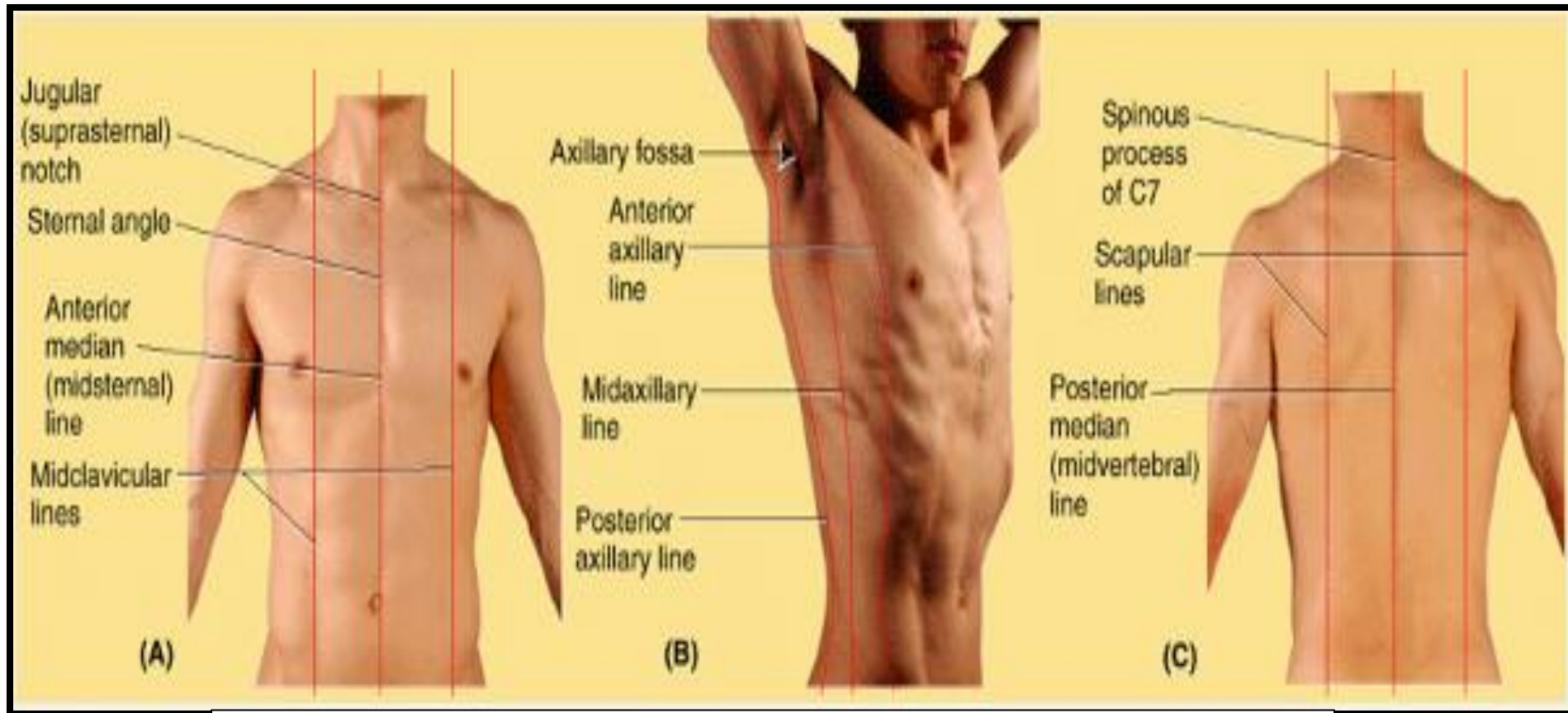


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Surface anatomy: Dermatomes

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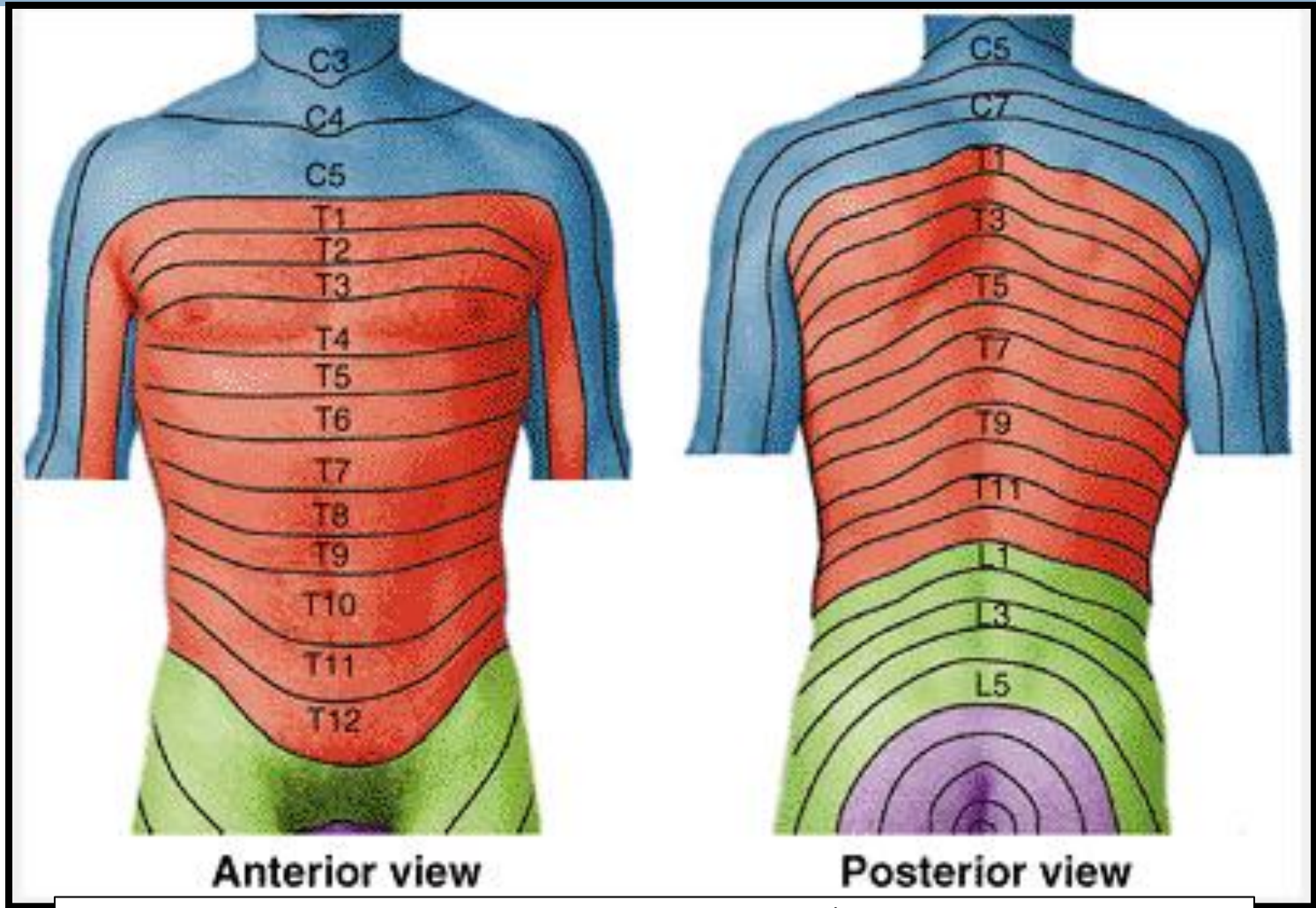


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Summary: Lecture's map

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- **Intercostal space.**

- **Intercostal:**

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Please try to answer this question

52

- ☐ **The intercostobrachial nerve:**
- a) **Supplies the floor of the axilla.**
 - b) **Emerges from the 5th intercostal nerve.**
 - c) **Is a muscular branch of intercostal nerve.**
 - d) **Is an anterior cutaneous branch of intercostal nerve.**
 - e) **Communicates with the lateral brachial cutaneous nerve.**

Please try to answer this question

53

- **The right superior intercostal vein is typically the final tributary of:**
 - a) **The azygos vein.**
 - b) **The accessory hemiazygos vein.**
 - c) **The hemiazygos vein.**
 - d) **The superior vena cava.**
 - e) **The right brachiocephalic vein.**

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